

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	1	(line and expand\$3 and pixel and shade and area and edge).CLM.	US-PGPUB	OR	ON	2006/09/01 14:47

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	8	345/597.ccls.	US-PGPUB; USOCR; EPO; JPO; DERWENT	OR	ON	2006/09/01 14:52

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S355	4	S354	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S354	4	382/266.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S353	1	382/272.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S352	8	382/269.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S350	4	382/266.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S235	1	382/272.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:04
S351	4	S350	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S348	4	382/266.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S347	0	S346	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03

## EAST Search History

S34 6	0	382/272.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S34 5	0	382/264.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S34 4	3	S343	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S34 3	3	382/258.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S23 7	0	382/264.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S22 3	4	382/266.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:03
S34 2	0	382/258.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S34 1	0	S340	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S34 0	0	382/206.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S33 9	0	382/202.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02

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S338	0	S337	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S337	0	382/258.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S336	0	382/202.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S219	0	382/258.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S206	0	382/202.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S200	0	382/202.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:02
S335	6	S334	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01
S334	6	382/199.ccls. and (cover\$3 same pixel same shad\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01
S332	6	382/199.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01
S328	82	382/193.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01

## EAST Search History

S32 6	9	345/441.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01
S18 7	6	382/199.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:01
S33 1	0	S330	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S33 0	0	382/194.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S32 9	82	S328	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S32 7	9	S326	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S32 5	4	345/443.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S18 1	4	345/443.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 11:00
S32 4	24	S323	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S32 3	24	345/443.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59

## EAST Search History

S32 2	27	345/441.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S32 1	3	S320	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S32 0	3	345/441.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 9	14	S318	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 8	14	345/443.ccls. and (cover\$3 same pixel same shad\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 7	17	S316	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 6	17	345/441.ccls. and (cover\$3 same pixel same shad\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 4	14	345/443.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S31 3	17	345/441.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59
S17 6	25	345/441.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:59

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S31 5	14	S314	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:58
S17 0	17	345/441.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:58
S31 2	51	S311	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:56
S31 1	51	345/617.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:56
S31 0	62	345/615.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:56
S30 6	82	345/614.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:56
S30 4	43	345/612.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:56
S30 7	82	S306	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:55
S30 5	43	S304	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:55
S30 3	17	345/611.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:55



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S16 7	60	345/615.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:55
S16 1	16	345/611.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:55
S30 2	9	S301	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:53
S30 1	9	345/611.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:53
S15 8	88	345/611.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:53
S29 8	95	S297	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S29 7	95	345/611.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S29 6	28	S295	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S29 5	28	345/611.ccls. and (cover\$3 same pixel same shad\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S29 4	27	S293	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47

## EAST Search History

S29 3	27	345/611.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S29 0	2	(345/428.ccls. or 345/581.ccls. or 345/596.ccls. or 345/597.ccls. or 345/606.ccls.) and (alias\$3 and (line same cover\$3 same pixel same shad\$3))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S15 6	25	345/611.ccls. and (cover\$3 same pixel same shad\$3) and line	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:47
S28 8	1	345/606.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:46
S28 7	3	345/606.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:46
S15 2	1	(345/428.ccls. or 345/581.ccls. or 345/596.ccls. or 345/597.ccls. or 345/606.ccls.) and (alias\$3 and (line same cover\$3 same pixel same shad\$3))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:46
S28 9	1	S288	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S28 6	3	S285	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S28 5	3	345/597.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S28 4	13	S283	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45

## EAST Search History

S28 3	13	345/606.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S28 1	1	345/597.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S14 8	3	345/606.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S14 0	1	345/597.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:45
S28 0	0	345/597.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 9	0	S278	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 8	0	345/596.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 7	7	S276	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 6	7	345/596.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 5	1	S274	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44

## EAST Search History

S27 4	1	345/596.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 2	0	345/596.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S13 4	0	345/596.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:44
S27 0	0	S269	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S26 9	0	345/596.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S26 7	30	S266	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S26 6	30	345/581.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S26 5	1	S264	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S26 3	3	345/581.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43
S13 3	29	345/581.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:43

## EAST Search History

S26 4	1	345/581.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:42
S26 2	0	345/428.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:42
S13 1	3	345/581.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:42
S12 9	0	345/428.ccls. and (alias\$3 and ((extend\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:42
S26 0	1	345/428.ccls. and (alias\$3 and ((expand\$3 or expans\$3) near7 line) and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:41
S25 9	31	345/428.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:41
S26 1	1	S260	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:40
S12 7	29	345/428.ccls. and (line and alias\$3 and area and (pixel near5 center))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/08/30 10:40
S25 8	3	hong-mike.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S25 7	0	S256	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36

## EAST Search History

S25 6	0	hong-zheu.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S25 4	1	S253	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S25 3	1	jiao-yang-jeff.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S25 2	2	jiao-jeff.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S12 6	3	hong-mike.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36
S12 2	1	jiao-jeff.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2006/08/30 10:36



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Please review the [Quick Tips](#) below or for more information see the [Search Tips](#).

### Quick Tips

- Enter your search terms in lower case with a space between the terms.

sales offices

You can also enter a full question or concept in plain language.

Where are the sales offices?

- Capitalize proper nouns to search for specific people, places, or products.

John Colter, Netscape Navigator

- Enclose a phrase in double quotes to search for that exact phrase.

"museum of natural history" "museum of modern art"

- Narrow your searches by using a **+** if a search term must appear on a page.

museum +art

- Exclude pages by using a **-** if a search term must not appear on a page.

museum -Paris

Combine these techniques to create a specific search query. The better your description of the information you want, the more relevant your results will be.

museum +"natural history" dinosaur -Chicago

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## Nothing Found

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### Quick Tips

- Enter your search terms in lower case with a space between the terms.

sales offices

You can also enter a full question or concept in plain language.

Where are the sales offices?

- Capitalize proper nouns to search for specific people, places, or products.

John Colter, Netscape Navigator

- Enclose a phrase in double quotes to search for that exact phrase.

"museum of natural history" "museum of modern art"

- Narrow your searches by using a **+** if a search term must appear on a page.

museum +art

- Exclude pages by using a **-** if a search term must not appear on a page.

museum -Paris

Combine these techniques to create a specific search query. The better your description of the information you want, the more relevant your results will be.

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Neil Sullivan, C Durward Rogers, Stephen Daniel

February 1986 **ACM SIGGRAPH Computer Graphics**, Volume 20 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(982.82 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

A research organization or graphics house often has a need for custom pictures for presentations or other purposes. These pictures may be prohibitively expensive, if not impossible to create, if they are produced by a commercial art firm. For groups that have such a need, an in-house computer-controlled camera may be a solution. To develop a quality system, users will have to overcome a series of electronic, mechanical, photographic and computer-related hurdles. This tutorial deals with adjustme ...

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## 1 [Level set and PDE methods for computer graphics](#)



David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**

**SIGGRAPH '04**

**Publisher:** ACM Press

Full text available: [pdf\(17.07 MB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...

## 2 [Pixel-planes 5: a heterogeneous multiprocessor graphics system using processor-enhanced memories](#)



Henry Fuchs, John Poulton, John Eyles, Trey Greer, Jack Goldfeather, David Ellsworth, Steve Molnar, Greg Turk, Brice Tebbs, Laura Israel

July 1989 **ACM SIGGRAPH Computer Graphics , Proceedings of the 16th annual conference on Computer graphics and interactive techniques SIGGRAPH '89**, Volume 23 Issue 3

**Publisher:** ACM Press

Full text available: [pdf\(2.01 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper introduces the architecture and initial algorithms for Pixel-Planes 5, a heterogeneous multi-computer designed both for high-speed polygon and sphere rendering (1M Phong-shaded triangles/second) and for supporting algorithm and application research in interactive 3D graphics. Techniques are described for volume rendering at multiple frames per second, font generation directly from conic spline descriptions, and rapid calculation of radiosity form-factors. The hardware consists of up t ...

## 3 [Fast spheres, shadows, textures, transparencies, and image enhancements in pixel-planes](#)



Henry Fuchs, Jack Goldfeather, Jeff P. Hultquist, Susan Spach, John D. Austin, Frederick P. Brooks, John G. Eyles, John Poulton

July 1985 **ACM SIGGRAPH Computer Graphics , Proceedings of the 12th annual conference on Computer graphics and interactive techniques SIGGRAPH '85**, Volume 19 Issue 3

**Publisher:** ACM Press

Full text available: [pdf\(4.13 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)





Pixel-planes is a logic-enhanced memory system for raster graphics and imaging.

Although each pixel-memory is enhanced with a one-bit ALU, the system's real power comes from a tree of one-bit adders that can evaluate linear expressions  $Ax+By+C$  for every pixel  $(x,y)$  simultaneously, as fast as the ALUs and the memory *circuits* can accept the results. We and others have begun to develop a variety of algorithms that exploit this fast linear expression evaluation capability. In th ...

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### 1 [The elements of nature: interactive and realistic techniques](#)

 Oliver Deusen, David S. Ebert, Ron Fedkiw, F. Kenton Musgrave, Przemyslaw Prusinkiewicz, Doug Roble, Jos Stam, Jerry Tessendorf


August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**  
**SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(17.65 MB) Additional Information: [full citation](#), [abstract](#)

This updated course on simulating natural phenomena will cover the latest research and production techniques for simulating most of the elements of nature. The presenters will provide movie production, interactive simulation, and research perspectives on the difficult task of photorealistic modeling, rendering, and animation of natural phenomena. The course offers a nice balance of the latest interactive graphics hardware-based simulation techniques and the latest physics-based simulation techni ...

### 2 [GPGPU: general purpose computation on graphics hardware](#)

 David Luebke, Mark Harris, Jens Krüger, Tim Purcell, Naga Govindaraju, Ian Buck, Cliff Woolley, Aaron Lefohn

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**  
**SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(63.03 MB) Additional Information: [full citation](#), [abstract](#)

The graphics processor (GPU) on today's commodity video cards has evolved into an extremely powerful and flexible processor. The latest graphics architectures provide tremendous memory bandwidth and computational horsepower, with fully programmable vertex and pixel processing units that support vector operations up to full IEEE floating point precision. High level languages have emerged for graphics hardware, making this computational power accessible. Architecturally, GPUs are highly parallel s ...

### 3 [Level set and PDE methods for computer graphics](#)

 David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**
**SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(17.07 MB) Additional Information: [full citation](#), [abstract](#), [citations](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...

### 4 [Real-time volume graphics](#)




Klaus Engel, Markus Hadwiger, Joe M. Kniss, Aaron E. Lefohn, Christof Rezk Salama, Daniel Weiskopf

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**

**SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  [pdf\(7.63 MB\)](#) Additional Information: [full citation](#), [abstract](#)

The tremendous evolution of programmable graphics hardware has made high-quality real-time volume graphics a reality. In addition to the traditional application of rendering volume data in scientific visualization, the interest in applying these techniques for real-time rendering of atmospheric phenomena and participating media such as fire, smoke, and clouds is growing rapidly. This course covers both applications in scientific visualization, e.g., medical volume data, and real-time rendering, ...

**5** High dynamic range imaging



Paul Debevec, Erik Reinhard, Greg Ward, Sumanta Pattanaik

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**

**SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  [pdf\(20.22 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Current display devices can display only a limited range of contrast and colors, which is one of the main reasons that most image acquisition, processing, and display techniques use no more than eight bits per color channel. This course outlines recent advances in high-dynamic-range imaging, from capture to display, that remove this restriction, thereby enabling images to represent the color gamut and dynamic range of the original scene rather than the limited subspace imposed by current monitor ...

**6** Collision detection and proximity queries




Sunil Hadap, Dave Eberle, Pascal Volino, Ming C. Lin, Stephane Redon, Christer Ericson

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**

**SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  [pdf\(11.22 MB\)](#) Additional Information: [full citation](#), [abstract](#)

This course will primarily cover widely accepted and proved methodologies in collision detection. In addition more advanced or recent topics such as continuous collision detection, ADFs, and using graphics hardware will be introduced. When appropriate the methods discussed will be tied to familiar applications such as rigid body and cloth simulation, and will be compared. The course is a good overview for those developing applications in physically based modeling, VR, haptics, and robotics.

**7** Facial modeling and animation



Jörg Haber, Demetri Terzopoulos

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes**

**SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  [pdf\(18.15 MB\)](#) Additional Information: [full citation](#), [abstract](#)

In this course we present an overview of the concepts and current techniques in facial modeling and animation. We introduce this research area by its history and applications. As a necessary prerequisite for facial modeling, data acquisition is discussed in detail. We describe basic concepts of facial animation and present different approaches including parametric models, performance-, physics-, and learning-based methods. State-of-the-art techniques such as muscle-based facial animation, mass-s ...


**8** Texture mapping 3D models of real-world scenes



Frederick M. Weinhaus, Venkat Devarajan

December 1997 **ACM Computing Surveys (CSUR)**, Volume 29 Issue 4

**Publisher:** ACM Press

Full text available:  [pdf\(1.98 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#), [review](#)

Texture mapping has become a popular tool in the computer graphics industry in the last few years because it is an easy way to achieve a high degree of realism in computer-

generated imagery with very little effort. Over the last decade, texture-mapping techniques have advanced to the point where it is possible to generate real-time perspective simulations of real-world areas by texture mapping every object surface with texture from photographic images of these real-world areas. The technique ...

**Keywords:** anti-aliasing, height field, homogeneous coordinates, image perspective transformation, image warping, multiresolution data, perspective projection, polygons, ray tracing, real-time scene generation, rectification, registration, texture mapping, visual simulators, voxels

## 9 Radiance interpolants for accelerated bounded-error ray tracing



Kavita Bala, Julie Dorsey, Seth Teller

July 1999 **ACM Transactions on Graphics (TOG)**, Volume 18 Issue 3

**Publisher:** ACM Press

Full text available: [pdf\(888.58 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Ray tracers, which sample radiance, are usually regarded as offline rendering algorithms that are too slow for interactive use. In this article we present a system that exploits object-space, ray-space, image-space, and temporal coherence to accelerate ray tracing. Our system uses per-surface interpolants to approximate radiance both interactive and batch ray tracers. Our approach explicitly decouples the two primary operations of a ray tracer—shading and visibility de ...

**Keywords:** 4D interpolation, approximation, data structures, error bounds, interactive, interval arithmetic, radiance, rendering, rendering systems, visibility

## 10 Computational Approaches to Image Understanding



Michael Brady

March 1982 **ACM Computing Surveys (CSUR)**, Volume 14 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(10.04 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

## 11 Three-dimensional object recognition



Paul J. Besl, Ramesh C. Jain

March 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(7.76 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A general-purpose computer vision system must be capable of recognizing three-dimensional (3-D) objects. This paper proposes a precise definition of the 3-D object recognition problem, discusses basic concepts associated with this problem, and reviews the relevant literature. Because range images (or depth maps) are often used as sensor input instead of intensity images, techniques for obtaining, processing, and characterizing range data are also surveyed.

## 12 High-performance polygon rendering



Kurt Akeley, Tom Jermoluk

June 1988 **ACM SIGGRAPH Computer Graphics , Proceedings of the 15th annual conference on Computer graphics and interactive techniques SIGGRAPH '88**, Volume 22 Issue 4

**Publisher:** ACM Press

Full text available: [pdf\(1.73 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper describes a system architecture for realtime display of shaded polygons. Performance of 100,000 lighted, 4-sided polygons per second is achieved. Vectors and points draw at the rate of 400,000 per second. High-speed pan and zoom, alpha blending, realtime video input, and antialiased lines are supported. The architecture heavily

leverages parallelism in several forms: pipeline, vector, and array processing. It is unique in providing efficient and balanced graphics that support interact ...

**Keywords:** graphics systems

### 13 State of the art in Monte Carlo global illumination



Philip Dutré, Henrik Wann Jensen, Jim Arvo, Kavita Bala, Philippe Bekaert, Steve Marschner, Matt Pharr

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes  
SIGGRAPH '04**

**Publisher:** ACM Press

Full text available: [pdf\(5.48 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Realistic image synthesis is increasingly important in areas such as entertainment (movies, special effects and games), design, architecture and more. A common trend in all these areas is the quest for more realistic images of increasingly complex models. Monte Carlo global illumination algorithms are the only methods that can handle this complexity. Recent advances in algorithms and compute power has made Monte Carlo algorithms very practical and a natural choice for most problems. The purpose o ...

### 14 Efficient algorithms for local and global accessibility shading



Gavin Miller

July 1994 **Proceedings of the 21st annual conference on Computer graphics and interactive techniques**

**Publisher:** ACM Press

Full text available: [pdf\(1.11 MB\)](#) [ps\(13.03 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper discusses the use of two different approaches for computing the "accessibility" of a surface. These metrics characterize how easily a surface may be touched by a spherical probe. The paper also presents various acceleration techniques for accessibility. The idea of surface accessibility is extended to include "global accessibility" which measures the ability of a spherical probe to enter a structure from outside as well as to fit locally on the surface. Th ...

**Keywords:** aging, surface accessibility shading, visualisation

### 15 Crowd and group animation



Daniel Thalmann, Christophe Hery, Seth Lippman, Hiromi Ono, Stephen Regelous, Douglas Sutton

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes  
SIGGRAPH '04**

**Publisher:** ACM Press

Full text available: [pdf\(20.19 MB\)](#) Additional Information: [full citation](#), [abstract](#)

A continuous challenge for special effects in movies is the production of realistic virtual crowds, in terms of rendering and behavior. This course will present state-of-the-art techniques and methods. The course will explain in details the different approaches to create virtual crowds: particle systems with flocking techniques using attraction and repulsion forces, copy and pasting techniques, agent-based methods. The architecture of software tools will be presented including the MASSIVE softwa ...

### 16 Two methods for display of high contrast images



Jack Tumblin, Jessica K. Hodgins, Brian K. Guenter

January 1999 **ACM Transactions on Graphics (TOG)**, Volume 18 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(10.28 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

High contrast images are common in night scenes and other scenes that include dark shadows and bright light sources. These scenes are difficult to display because their contrasts greatly exceed the range of most display devices for images. As a result, the

image contrasts are compressed or truncated, obscuring subtle textures and details. Humans view and understand high contrast scenes easily, "adapting" their visual response to avoid compression or truncation with no apparent ...

**Keywords:** adaptation, tone reproduction, visual appearance

17 Leo: a system for cost effective 3D shaded graphics



Michael F. Deering, Scott R. Nelson

September 1993 **Proceedings of the 20th annual conference on Computer graphics and interactive techniques**

**Publisher:** ACM Press

Full text available: [pdf\(241.27 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** 3D graphics hardware, antialiased lines, floating-point microprocessors, gouraud shading, parallel graphics algorithms, rendering

18 Splatting without the blur

Klaus Mueller, Torsten Möller, Roger Crawfis

October 1999 **Proceedings of the conference on Visualization '99: celebrating ten years**

**Publisher:** IEEE Computer Society Press

Full text available: [pdf\(283.67 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Splatting is a volume rendering algorithm that combines efficient volume projection with a sparse data representation: Only voxels that have values inside the iso-range need to be considered, and these voxels can be projected via efficient rasterization schemes. In splatting, each projected voxel is represented as a radially symmetric interpolation kernel, equivalent to a fuzzy ball. Projecting such a basis function leaves a fuzzy impression, called a footprint or splat, on the screen ...

19 A tutorial on developing a computer-controlled camera system



Neil Sullivan, C Durward Rogers, Stephen Daniel

February 1986 **ACM SIGGRAPH Computer Graphics**, Volume 20 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(982.82 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

A research organization or graphics house often has a need for custom pictures for presentations or other purposes. These pictures may be prohibitively expensive, if not impossible to create, if they are produced by a commercial art firm. For groups that have such a need, an in-house computer-controlled camera may be a solution. To develop a quality system, users will have to overcome a series of electronic, mechanical, photographic and computer-related hurdles. This tutorial deals with adjusting ...

20 Reality Engine graphics



Kurt Akeley

September 1993 **Proceedings of the 20th annual conference on Computer graphics and interactive techniques**

**Publisher:** ACM Press

Full text available: [pdf\(192.63 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)



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IEEE JNL IEEE Journal or Magazine

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IEEE CNF IEEE Conference Proceeding

IEE CNF IEE Conference Proceeding

IEEE STD IEEE Standard

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IEE CNF IEE Conference Proceeding

IEEE STD IEEE Standard

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**IEEE STD** IEEE Standard

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- 1 METHOD FOR BINARIZING LIGHT AND SHADE IMAGE AND RECORDING MEDIUM WHERE BINARIZING PROGRAM IS RECORDED**  
Inventor: KATABUCHI NORIFUMI; OHARA SHUICHI;      Applicant: NIPPON TELEGRAPH & TELEPHONE  
(+2)  
EC:      IPC: *H04N1/387; G06T1/00; G06T5/00* (+9)  
Publication info: **JP2000357226** - 2000-12-26
- 2 Gray scaled data generating device which balances width and shade of strokes by repositioning their center line to a predetermined distance from pixel border**  
Inventor: NAKAI MASARU (JP); MATSUI MIKA (JP);      Applicant: MATSUSHITA ELECTRIC IND CO LTD (JP)  
(+3)  
EC: G06T5/20      IPC: *H04N1/407; G06T5/20; G09G5/24* (+8)  
Publication info: **US5909221** - 1999-06-01
- 3 CONTROLLER FOR TORCH HEIGHT**  
Inventor: SUGITANI YUJI; KANJIYOU YOSHIHIRO;      Applicant: NIPPON KOKAN KK  
(+1)  
EC:      IPC: *G02B7/36; B23K9/12; B23K9/127* (+7)  
Publication info: **JP63256278** - 1988-10-24
- 4 DEVICE FOR SETTING TORCH HEIGHT**  
Inventor: SUGITANI YUJI; KANJIYOU YOSHIHIRO;      Applicant: NIPPON KOKAN KK  
(+1)  
EC:      IPC: *B23K9/127; B23K9/12; B23K9/127* (+2)  
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### **1 Method and apparatus to efficiently interpolate polygon attributes in two dimensions at a prescribed clock rate**

**Inventor:** PIAZZA THOMAS A (US); HARTOG R SCOTT (US); (+4) **Applicant:** REAL 3D INC (US)

**EC:** G06T3/40B

**IPC:** **G06T3/40; G06T3/40;** (IPC1-7): G06T1/00 (+1)

**Publication info:** **US6072505** - 2000-06-06

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line expand center interpolate slope factor

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**Date of publication of application** --- e.g. 19980401 - 19980405

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